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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/825,884	04/16/2004	Marc Le Metais	040183-000300US	8608
20350 7590 02/21/2007 TOWNSEND AND TOWNSEND AND CREW, LLP TWO EMBARCADERO CENTER EIGHTH FLOOR SAN FRANCISCO, CA 94111-3834			EXAMINER PETTITT, JOHN F	
			ART UNIT 3744	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		02/21/2007	PAPER	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/825,884	<b>Applicant(s)</b> LE METAIS, MARC	
	<b>Examiner</b> John Pettitt	<b>Art Unit</b> 3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 November 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 November 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Response to Amendment and Arguments***

Applicant's arguments filed 11/20/2006 with respect to all claims have been fully considered.

Applicant's arguments asserting that independent claims 1 and 12 are now not anticipated by Stockman and Low are persuasive due to the amendment entered by the applicant. However, upon further consideration, a new ground(s) of rejection is made for claims 1, 12 and 16 in view of Roberts (US 6,742,357).

Applicant's arguments relative to independent claim 3 are not persuasive. The applicant has been provided with reasons why someone with ordinary skill in the art, at the time the invention was made would be motivated to modify Klein Nagel Voort. Further explanation has been provided below to clarify the reasons for rejection.

Applicant's arguments relative to independent claim 13 are not persuasive as the negative limitation provided by amendment encompasses an interpretation that does not preclude the process described by Klein Nagel Voort.

The indicated allowability of claims 5 is withdrawn. As such this office action is being made non-final to afford the applicant the opportunity to respond to the new grounds of rejection for claim 5.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1, 12, and 16** are rejected under 35 U.S.C. 102(b) as being anticipated by Roberts (US 6,742,357).

**In regard to claim 1**, Roberts ('357) teach a liquefaction plant (Fig. 2) comprising one pre-cooling heat exchanger (310 or 311); one main heat exchanger (312); one main refrigerant circuit (closed loop having compressor 319); a pre-cooling refrigerant circuit (closed loop having compressor 203 or loop having compressor 101); one additional circuit (cooled water circuit employed in 320 and 327) that is separate from the pre-cooling refrigerant circuit such that said additional circuit does not exchange heat with the pre-cooling refrigerant circuit (see Fig. 2) and the main refrigerant circuit (with compressor 319) is separate from the pre-cooling refrigerant circuit (with compressor 203) such that said main refrigerant circuit does not exchange heat with the pre-cooling refrigerant circuit (see Fig. 2).

**In regard to claim 12**, Roberts ('357) teaches a process for liquefying natural gas comprising

- 1) Pre-cooling natural gas in a pre-cooling heat exchanger (310 or 311); (column 11, lines 20-25)

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- 2) Liquefying said pre-cooled natural gas in the main heat exchanger (312); (column 11, lines 59-61); the main heat exchanger comprising a first hot side (inside 312) having one inlet (9) connected to the outlet of the pre-cooling heat exchanger (310 or 311) and an outlet (13) for liquefied natural gas.
- 3) Removing heat from the pre-cooled natural gas flowing through the first hot side of the main heat exchanger using a main refrigerant circuit (closed loop with compressor 319); (column 11, lines 45-50)
- 4) Removing heat from the natural gas in the pre-cooling heat exchanger (310) using a pre-cooling refrigerant circuit (closed loop with compressor 203 or loop with compressor 101); (column 11, lines 25, 38)
- 5) Removing heat from the main refrigerant in the main refrigerant circuit using one additional circuit (cooled water circuit employed in 320 and 327), (column 16, line 43; column 12, line 30)
  - a. wherein step 5 is separate from step 4 (separate heat exchangers) and
  - b. wherein step 4 does not make use of the main refrigerant circuit to exchange heat with the pre-cooling refrigerant circuit (the main refrigerant circuit is not employed as an intermediary heat transfer circuit).

**In regard to claim 16**, Roberts ('357) teaches the process of claim 12 carried out in a plant that meets all the limitations of claim 1.

**Claims 12-13, and 16-17** are rejected under 35 U.S.C. 102(b) as being anticipated by Klein Nagel Voort (US 6,389,844 B1).

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**In regard to claim 12**, Klein Nagel Voort ('844) teaches a process for liquefying natural gas comprising

- 1) Pre-cooling natural gas in a pre-cooling heat exchanger (column 3, lines 50-64);
- 2) Liquefying the pre-cooled natural gas in one heat exchanger (column 3, lines 65 - column 4, line 1);
- 3) Removing heat from the natural gas using a main refrigerant circuit (column 3, lines 65 - column 4, line 1);
- 4) Removing heat from the natural gas in the pre-cooling heat exchanger (15) using a pre-cooling refrigerant circuit (3; column 3, lines 51-62);
- 5) Removing heat from the main refrigerant in the main refrigerant circuit using one additional circuit (43 or 43'), where step 5 is separate from step 4 (separate heat exchangers) and where step 4 does not make use of the main refrigerant circuit to exchange heat with the pre-cooling refrigerant circuit (the main refrigerant circuit is not employed as an intermediary heat transfer circuit).

**In regard to claim 16**, Klein Nagel Voort ('844) teaches the process of claim 12 carried out in a plant that meets all the limitations of claim 1.

**In regard to claim 13**, Klein Nagel Voort ('844) teaches a process for liquefying natural gas comprising

- 1) pre-cooling natural gas in a pre-cooling heat exchanger into a flow of pre-cooled natural gas (column 3, lines 50-64);
- 2) distributing said flow of pre-cooled natural gas into two distributed pre-cooled flows (column 3, lines 65-67);

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3) liquefying the two distributed pre-cooled gas flows in two main heat exchangers each comprising a first hot side having one inlet receiving one distributed pre-cooled gas flow and an outlet for liquefied natural gas (column 3, lines 65 - column 4, line 1);

4) removing heat from the natural gas flow through the first hot side of the corresponding main heat exchanger using two main refrigerant circuits (column 4, lines 7-24);

5) removing heat from the natural gas in the pre-cooling heat exchanger using a pre-cooling refrigerant circuit (column 3, lines 51-62);

6) removing heat from the main refrigerants in each of the main refrigerant circuits using two additional circuits (43 and 43'); where the step of removing heat from the main refrigerants is separate from the step of removing heat from the natural gas in step 5 (heat is removed from the natural gas in the pre-cooling heat exchanger and separately heat is removed from the main refrigerant circuits using heat exchangers 58 and 58'); and wherein the step of removing heat from the natural gas in step 5 (using heat exchanger 15) does not make use of said main refrigerant circuits to exchange heat with the pre-cooling refrigerant circuit (the main refrigerant circuit is not employed as an intermediary heat transfer circuit).

**In regard to claim 17**, the process of claim 13 is an obvious process to carry out in the plant described for the rejection of claim 3. The process is not more limiting than basic operation of the plant described for the rejection of claim 3.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1-9** are rejected under 35 U.S.C. 103(a) as being unpatentable over the obvious modification of Klein Nagel Voort (US 6,389,844 B1).

**In regard to claim 3**, Klein Nagel Voort ('844) teaches a liquefaction plant comprising a pre-cooling heat exchanger (15); a distributor (4); two main heat exchangers (5 and 5'); two main refrigerant circuits (cooling the natural gas streams 25 and 25'); a pre-cooling refrigerant circuit (cooling the natural gas through heat exchange in heat exchanger 15); and that the main refrigerant circuits are separate from the pre-cooling refrigerant circuit.

Klein Nagel Voort ('844) does not explicitly teach that the two additional circuits are separate from the pre-cooling circuit such that the additional circuits do not exchange heat with the pre-cooling circuit and such that the main circuits do not exchange heat with the pre-cooling circuit. However, propane is commonly used as the pre-cooling refrigerant in pre-cooling refrigerant circuits as the boiling point of propane is relatively high (see, for example, Klein Nagel Voort ('844) --column 4, lines 25-31). One of ordinary skill in the art, at the time the invention was made, would have recognized that the condensation of the main refrigerants in the main refrigerant circuits (via heat

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exchangers 58 and 58') could be done more effectively (i.e. equivalent heat transfer with smaller heat exchangers (58 and 58') or higher flow rates with larger heat exchangers) by separating the two additional refrigerant circuits from the pre-cooling refrigerant circuit and charging the additional refrigerant circuits with a lower boiling point refrigerant.

The additional circuits would then be separated or combined depending on production demand and the sale price of natural gas. With higher demand and higher prices anticipated one would make the additional circuits separate such that production could be increased at the expense of the refrigeration components (capital costs - compressor, heat exchangers, etc). While with lower demand and lower prices one would combine the additional circuits (one compressor, one condenser, one expansion device and integrated refrigerant heat exchangers) to save on the capital costs. One of ordinary skill in the art, at the time the invention was made, would know how to balance these demands and would be motivated to do so to improve the profitability of the plant.

**In regard to claim 4**, Klein Nagel Voort ('844) teaches that the additional circuits each comprise a heat exchanger (58 and 58'); a compressor (50 and 50'); a cooler (56 and 56'); and an expansion device (45 and 45'). The inlet of the compressor (50 and 50') is connected to the outlet of the cold side of the heat exchanger (58 and 58') by return conduit (46 and 46'). The outlet of the compressor (50 and 50') is connected to the inlet of the cooler (56 and 56'). The conduit (44 and 44') extends via the expansion device (45 and 45').

**In regard to claim 5**, see claim 3 discussion of the separate additional circuit variant.

**In regard to claim 6**, see claim 3 discussion of the combined additional circuit variant.

**In regard to claim 7**, Klein Nagel Voort ('844) teaches the plant comprises two main heat exchangers (5 and 5'); two main refrigerant circuits (9 and 9'), and two additional circuits (43 and 43').

**In regard to claim 9**, Klein Nagel Voort ('844) teaches the pre-cooling refrigerant circuit comprises a heat exchanger (15); a compressor (31); a cooler (36); and an expansion device (38). The inlet (33) of the compressor (31) is connected to the outlet (40) of the cold side of the heat exchanger (15) by return conduit (41). The outlet (34) of the compressor (31) is connected to the inlet of the cooler (36). The conduit (line connecting outlet of cooler and the inlet of the heat exchanger (15)) extends via the expansion device (38).

**In regard to claim 1**, see claim 3.

**In regard to claim 2**, see claim 4.

**In regard to claim 8**, see claim 9.

**Claims 10-11** are rejected under 35 U.S.C. 103(a) as being unpatentable over the obvious modification of Klein Nagel Voort (US 6,389,844 B1) as described for claim 3 above and further in view of Roberts et al. (US 6,308,531 B1).

**In regard to claims 10-11**, though the obvious modification of Klein Nagel Voort ('844) meets all the limitations of claim 1 and 3, Klein Nagel Voort ('844) does not teach

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a pretreatment downstream of the pre-cooling heat exchanger. However, Roberts et al. ('531) teach a pretreatment downstream of the pre-cooling heat exchanger for removing the heavy components from the gas (108, column 8, lines 6-16). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine the liquefaction system discussed for claims 1 and 3 with the pretreatment described by Roberts et al. ('531) for the purpose of removing part of the heavy components from the gas (scrub column 108, column 8, lines 6-16) as these components (for example pentane, hexane and heavier components) will freeze in the colder parts of the LNG processing equipment and may cause blockage problems.

**In regard to claims 14-15**, Klein Nagel Voort ('844) meets all the limitations of claims 12 and 13, except a pretreatment downstream of the pre-cooling heat exchanger. However, Roberts et al. ('531) teach a pretreatment downstream of the pre-cooling heat exchanger for removing the heavy components from the gas (108, column 8, lines 6-16). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine the liquefaction system taught by Klein Nagel Voort ('844) with the pretreatment described by Roberts et al. ('531) for the purpose of removing part of the heavy components from the gas (scrub column 108, column 8, lines 6-16) as these components (for example pentane, hexane and heavier components) will freeze in the colder parts of the LNG processing equipment and may cause blockage problems.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Pettitt whose telephone number is 571-272-0771. The examiner can normally be reached on M-F 8a-4p.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler can be reached on 571-272-4834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JFP III  
February 7, 2007

  
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